Baryon Stopping In 158 GeV/N Pb+Pb Central Collisions

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We have measured the net protons (p minus $\bar{p}$) from central Pb+Pb collisions at a beam momentum of 158 GeV per nucleon using the NA49 Main time projection chambers (MTPC). The net proton rapidity distribution along with the net lambdas (Λ minus $\bar{\Lambda}$) show the degree to which the participating protons and neutrons are shifted in rapidity and converted into other types of baryons by the reaction. This measure of baryon stopping has been the subject of recent renewed theoretical study[1].

More than 40,000 events of the 5% most central collisions were selected for this analysis. Particle mass was determined by a statistical treatment of the amount of ionization produced in the MTPC. The detectors are situated 9 m downstream from the target and as a result, protons from lambda decays may enter into the detectors and be mistakenly determined to come from the primary interaction point. The magnitude of this contamination was calulated by a simulation using a measurement of lambdas by NA49[2] as the input distribution. Overall, 33% of the lambdas produce protons that appear to originate from the target.

Fig. 1 shows the measured rapidity distributions of net protons and net lambdas in solid points. The lambdas also include neutral sigmas. The depletion of protons near midrapidity is a result of the peaked shape of the lambda distribution and is not an indication of nuclear transparency. This is confirmed by the nearly flat distribution of total baryons near midrapidity shown at the bottom of Fig. 1. The net baryons are predicted by estimating the neutron and charged strange baryon spectra from the measured protons and neutral strange baryons and an assumption of the shape of the rapidity distribution. A study of VENUS and RQMD simulations indicates that the number of neutrons and protons in the final state are roughly equal[3] and an empirical formulation for the total number of strange baryons is given by $N_Y = 1.6(N_\Lambda + N_{\Sigma^o})$[4]. This leads to the formula $N_B = 2N_{p-\bar{p}} + 1.6N_{\Lambda-\bar{\Lambda}}$. In the rapidity interval $2.9 < y < 5.4$, there are 75 net protons and 181 net baryons.

References

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[2] NA49 Collaboration (C. Bormann *et al.*), J. Phys. G **23**, 1817 (1997)

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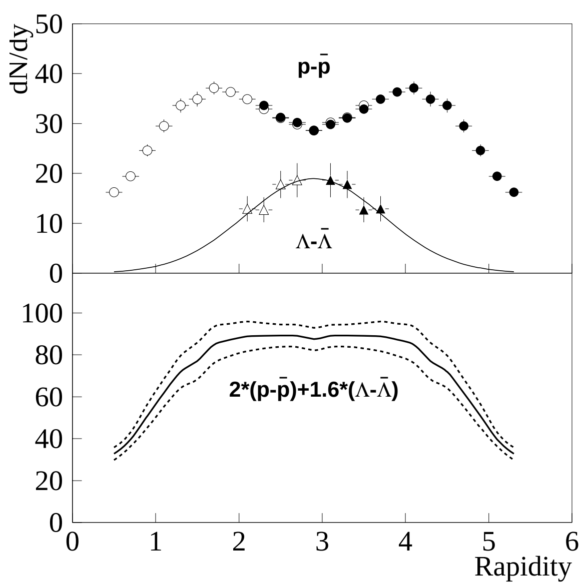

Figure 1: Preliminary rapidity distributions of net protons, net lambdas (top, filled points) and net baryons (bottom, solid line).